

Tracking downstream of the RICH

4 March 2019

Resolution in a high-p RICH

σ_θ for COMPASS RICH - NIMA A 616 (2010) 21

Pad size: **1 mrad** (12 x 12 mm²), **0.7 mrad** (12 x 12 mm²) (lever arm: 3 m)
Chrom. disp.: **0.9 mrad** (MAPMTS), **0.6 mrad** (CsI)
Spher. ab.s: **0.7 mrad** central region, **1.7 mrad** (peripheral region) (mean values !)
Others (*): **0.6 mrad** central region, **1.3 mrad** (peripheral region) (mean values !)

(*)

Rec. trajectory (for high-p RICHes making use of the trajectory information is a must)

Rec. momentum (worse in peripheral region: 1 analyzing magnet, p know at 1-2 %, centrally at 3-4%)

B field in RICH volume

Multiple scattering and *track extrapolation inside the RICH volume* :

important the track coordinates measured downstream of the RICH

Mirror imperfection/alignment (worst in the peripheral region: stat., syst.)

- High quality mirrors: **R**=6600 mm±1%, **D** (95% from pointlike source)< 3.5 mm, **roughness**, r.m.s. <1.6 nm;
ATTENTION: *tension between mirror quality and material budget*

Resolution in a high-p RICH for each photon

1. Multiple scattering:

- upstream window: 0.18 cm Al equivalent ($X_0=8.9$ cm) $\rightarrow 2.0 \% X_0$
- radiator gas 3.4 m C₄F₁₀ ($X_0=32.41$ m) $\rightarrow 10.5 \% X_0$
but, on average, ~ 2 m $\rightarrow 6.2 \% X_0$

Contribution to σ_θ :	0.36 mrad @ 10 GeV/c
	0.06 mrad @ 60 GeV/c

Recall: the whole RICH (including mirrors, downstream window): 22.5 % X_0

2. Trajectory extrapolation

- Strongly dependent on tracker resolution and lever arm

Tracking contribution to σ_θ :	0.5 mrad
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In TOTAL:	0.62 mrad @ 10 GeV/c
	0.50 mrad @ 60 GeV/c

3. IF Tracking downstream of the RICH with position resolution 0.2 mm and a lever arm of 5m
and *taking into account the whole RICH material*:

In TOTAL:	0.71 mrad @ 10 GeV/c
	0.12 mrad @ 60 GeV/c

Figures are given here